

### **ABSTRACT**

**[0024]** A method for the storage of hydrogen within a subterranean solid carbonaceous formation such as a coal seam. At least one well extends from the surface of the earth into the formation and a pressure gradient extends from the formation to the well to desorb methane within the formation and flow the methane into the well. Subsequent to recovery of the methane from the formation, gaseous hydrogen is injected into the well and into the formation. The injection of hydrogen is carried out under a pressure sufficient to cause the injected hydrogen to become absorbed within the matrix of the carbonaceous formation. Subsequent to storage of the hydrogen, a pressure gradient is established from the formation to the surface to withdraw previously introduced hydrogen to the surface. At least one common well is used for recovery of methane from the formation and introduction of hydrogen into the formation.